

CLAIMS

What is claimed is:

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- 1 1. A method of manufacturing phase-shifted masks, the method comprising the steps of:
2 providing, from a facilitator on behalf of a set of one or more parties that desire
3 masks, subsidies for production of phase-shifted masks;
4 paying for manufacture of said phase-shifted masks using compensation that includes
5 said subsidies from said facilitator;
6 causing a set of one or more mask makers to manufacture said phase-shifted masks
7 for said compensation; and
8 receiving, by said facilitator from said set of one or more parties, compensation for
9 said subsidies based on one or more factors including a factor that reflects
10 market success of integrated circuits produced using said phase-shifted masks.
 - 1 2. The method of Claim 1 wherein, for a particular party in said set of one or more
2 parties,
3 the facilitator agrees to provide subsidies for production of phase-shifted masks for a
4 defined population of designs; and
5 the particular party agrees to compensate the facilitator for the subsidies based on a
6 factor that reflects market success of each and every integrated circuit
7 produced by or for said particular party based on any design in said defined
8 population of designs.
 - 1 3. The method of Claim 1 wherein:
2 the phase-shifted masks include a phase-shifted mask for a particular design;
3 manufacture of a mask for said particular design using an alternative technology
4 would cost X;

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5 manufacture of the phase-shifted mask for the particular design costs Y, where Y is
6 greater than X; and
7 the step of providing subsidies includes providing a subsidy that is substantially equal
8 to Y-X for manufacture of said phase-shifted mask for said particular design.
9

1 4. The method of Claim 1 wherein the step of compensating the facilitator includes a
2 party from said set of one or more parties paying the facilitator based on number of
3 integrated circuits manufactured using a phase-shifted mask that was subsidized by
4 the facilitator.

1 5. The method of Claim 1 wherein the step of compensating the facilitator includes a
2 party from said set of one or more parties paying the facilitator for rental of a phase-
3 shifted mask that was subsidized by the facilitator.

1 6. The method of Claim 1 wherein the step of compensating the facilitator includes a
2 party from said set of one or more parties paying the facilitator based on revenues
3 derived from integrated circuits manufactured using a phase-shifted mask that was
4 subsidized by the facilitator.

1 7. The method of Claim 6 wherein the party pays the facilitator a per-unit amount that
2 decreases with increased volume of sales of integrated circuits manufactured using
3 said phase-shifted mask.

1 8. The method of Claim 1 wherein the set of one or more parties includes a plurality of
2 parties.

1 9. The method of Claim 1 wherein the set of one or more mask makers includes a
2 plurality of mask makers.

- 1 10. The method of Claim 8 wherein the set of one or more mask makers includes a
2 plurality of mask makers.
- 1 11. The method of Claim 1 further comprising the step of the facilitator certifying mask
2 makers that satisfy certain quality criteria.
- 1 12. The method of Claim 1 further comprising the step of the facilitator selecting the one
2 or more mask makers to manufacture said phase-shifted masks.
- 1 13. The method of Claim 1 further comprising the step of the facilitator gathering
2 information about jobs performed by mask makers, wherein said one or more mask
3 makers are selected to manufacture said phase-shifted masks based on said
4 information.
- 1 14. The method of Claim 13 further comprising the step of the facilitator determining
2 which mask makers to certify based on said information.
- 1 15. The method of Claim 13 wherein the information includes information from the mask
2 makers about reticles that they produce.
- 1 16. The method of Claim 15 further comprising the step of the facilitator causing the
2 mask maker to encode information about a particular reticle onto the particular
3 reticle.
- 1 17. The method of Claim 1 further comprising the step of the facilitator performing one
2 or more quality assurance tests on said phase-shifted masks.
- 1 18. The method of Claim 17 wherein the step of performing one or more quality
2 assurance tests is performed for a given phase-shifted mask prior to the facilitator
3 releasing said given phase-shifted mask to be used by a semiconductor manufacturer.
- 1 19. The method of Claim 1 further including the facilitator using a stepper simulation tool
2 to determine which flaws in said phase-shifted masks have to be corrected.
- 1 20. The method of Claim 19 further comprising the steps of:

2 the facilitator providing information about a particular phase-shifted mask acquired
3 through the use of the stepper simulation tool to a semiconductor
4 manufacturer; and
5 the semiconductor manufacturer adjusting parameters on an actual stepper that is used
6 with the particular phase-shifted mask based on the information.

1 21. The method of Claim 1 further comprising the step of the facilitator obtaining a
2 volume discount from a mask manufacturer based on a contract in which the
3 facilitator agrees to use the mask manufacturer to produce phase-shifted masks for a
4 plurality of semiconductor manufacturers.

1 22. The method of Claim 1 further comprising the step of the facilitator purchasing an
2 option from a mask maker that commits the mask maker to perform a certain volume
3 of future work for the facilitator; and
4 wherein the step of causing a set of one or more mask makers to manufacture said
5 phase-shifted masks includes said facilitator exercising said option.

1 23. The method of Claim 1 wherein:
2 the compensation for said subsidies is based on the number of semiconductors
3 produced by said phase-shifted masks; and
4 the method further comprises the steps of using a counter installed on stepper
5 equipment to determine the compensation.

1 24. The method of Claim 1 wherein:
2 the compensation for said subsidies is based on the number of semiconductors
3 produced by said phase-shifted masks; and
4 the method further comprises the steps of placing a counter device on at least one of
5 the phase-shifted masks to determine the compensation.

1 25. The method of Claim 1 further comprising the step of facilitator causing designs of at
2 least some of the integrated circuits produced using said phase-shifted masks to be
3 watermarked.

1 (26.) A phase-shifted mask produced by a process that includes the steps of:
2 providing, by a facilitator on behalf of a party that desires a mask, a subsidy for
3 production of said phase-shifted mask;
4 paying for manufacture of said phase-shifted mask using compensation that includes
5 said subsidy from said facilitator;
6 causing a mask maker to manufacture said phase-shifted mask for said compensation;
7 and
8 receiving, by the facilitator from said party, compensation for said subsidy based on
9 one or more factors including a factor that reflects market success of
10 integrated circuits produced using said phase-shifted mask.

1 27. An integrated circuit produced by a process that includes the steps of:
2 providing, by a facilitator on behalf of a party, a subsidy for production of said phase-
3 shifted mask;
4 paying for manufacture of said phase-shifted mask using compensation that includes
5 said subsidy from said facilitator;
6 causing a mask maker to manufacture said phase-shifted mask for said compensation;
7 manufacturing said integrated circuit based on said phase-shifted mask; and
8 receiving, by the facilitator from said party, compensation for said subsidy based on
9 one or more factors including a factor that reflects market success of said
10 integrated circuit.

- 1 28. A method of manufacturing masks using a particular technology when said particular
2 technology is preferable to but cost more than one or more alternative technologies,
3 the method comprising the steps of:
4 providing, from a facilitator on behalf of a set of one or more parties that desire
5 masks, subsidies for production of masks using said particular technology;
6 paying for manufacture of said masks using compensation that includes said subsidies
7 from said facilitator;
8 causing a set of one or more mask makers to manufacture said masks using said
9 particular technology for said compensation; and
10 receiving, by said facilitator from said set of one or more parties, compensation for
11 said subsidies based on one or more factors including a factor that reflects
12 market success of integrated circuits produced using said masks.
- 1 29. The method of Claim 28 wherein, for a particular party in said set of one or more
2 parties,
3 the facilitator agrees to provide subsidies for production of masks for a defined
4 population of designs; and
5 the particular party agrees to compensate the facilitator for the subsidies based on a
6 factor that reflects market success of each and every integrated circuit
7 produced by or for said particular party based on any design in said defined
8 population of designs.
- 1 30. The method of Claim 28 wherein:
2 the masks include a mask for a particular design;
3 manufacture of a mask for said particular design using an alternative technology
4 would cost X;

5 manufacture of the mask for the particular design using said particular technology
6 costs Y, where Y is greater than X; and
7 the step of providing subsidies includes providing a subsidy that is substantially equal
8 to Y-X for manufacture of said mask for said particular design using said
9 particular technology.

1 31. The method of Claim 28 wherein the step of compensating the facilitator includes a
2 party from said set of one or more parties paying the facilitator based on number of
3 integrated circuits manufactured using a mask that was subsidized by the facilitator.

1 32. The method of Claim 28 wherein the step of compensating the facilitator includes a
2 party from said set of one or more parties paying the facilitator for rental of a mask
3 that was subsidized by the facilitator.

1 33. The method of Claim 28 wherein the step of compensating the facilitator includes a
2 party from said set of one or more parties paying the facilitator based on revenues
3 derived from integrated circuits manufactured using a mask that was subsidized by
4 the facilitator.

1 34. The method of Claim 33 wherein the party pays the facilitator a per-unit amount that
2 decreases with increased volume of sales of integrated circuits manufactured using
3 said mask.

1 35. The method of Claim 28 wherein the set of one or more parties includes a plurality of
2 parties.

1 36. The method of Claim 28 wherein the set of one or more mask makers includes a
2 plurality of mask makers.

1 37. The method of Claim 35 wherein the set of one or more mask makers includes a
2 plurality of mask makers.

- 1 38. The method of Claim 28 further comprising the step of the facilitator certifying mask
2 makers that satisfy certain quality criteria.
- 1 39. The method of Claim 28 further comprising the step of the facilitator selecting the
2 one or more mask makers to manufacture said masks.
- 1 40. The method of Claim 28 further comprising the step of the facilitator gathering
2 information about jobs performed by mask makers, wherein said one or more mask
3 makers are selected to manufacture said masks based on said information.
- 1 41. The method of Claim 40 further comprising the step of the facilitator determining
2 which mask makers to certify based on said information.
- 1 42. The method of Claim 40 wherein the information includes information from the mask
2 makers about reticles that they produce.
- 1 43. The method of Claim 42 further comprising the step of the facilitator causing the
2 mask maker to encode information about a particular reticle onto the particular
3 reticle.
- 1 44. The method of Claim 28 further comprising the step of the facilitator performing one
2 or more quality assurance tests on said masks.
- 1 45. The method of Claim 44 wherein the step of performing one or more quality
2 assurance tests is performed for a given mask prior to the facilitator releasing said
3 given mask to be used by a semiconductor manufacturer.
- 1 46. The method of Claim 28 further including the facilitator using a stepper simulation
2 tool to determine which flaws in said masks have to be corrected.
- 1 47. The method of Claim 46 further comprising the steps of:
2 the facilitator providing information about a particular mask acquired through the use
3 of the stepper simulation tool to a semiconductor manufacturer; and
4 the semiconductor manufacturer adjusting parameters on an actual stepper that is used
5 with the particular mask based on the information.

- 1 48. The method of Claim 28 further comprising the step of the facilitator obtaining a
2 volume discount from a mask manufacturer based on a contract in which the
3 facilitator agrees to use the mask manufacturer to produce masks for a plurality of
4 semiconductor manufacturers.
- 1 49. The method of Claim 28 further comprising the step of the facilitator purchasing an
2 option from a mask maker that commits the mask maker to perform a certain volume
3 of future work for the facilitator; and
4 wherein the step of causing a set of one or more mask makers to manufacture said
5 masks includes said facilitator exercising said option.
- 1 50. The method of Claim 28 wherein:
2 the compensation for said subsidies is based on the number of semiconductors
3 produced by said masks; and
4 the method further comprises the steps of using a counter installed on stepper
5 equipment to determine the compensation.
- 1 51. The method of Claim 28 wherein:
2 the compensation for said subsidies is based on the number of semiconductors
3 produced by said masks; and
4 the method further comprises the steps of placing a counter device on at least one of
5 the masks to determine the compensation.
- 1 52. The method of Claim 28 further comprising the step of facilitator causing designs of
2 at least some of the integrated circuits produced using said masks to be watermarked.
- 1 53. A method of manufacturing products using a particular technology when said
2 particular technology is preferable to but cost more than one or more alternative
3 technologies, the method comprising the steps of:
4 providing, from a facilitator on behalf of a set of one or more parties, subsidies for
5 using said particular technology to manufacture products;

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6 paying for manufacture of said products using compensation that includes said
7 subsidies from said facilitator;
8 causing products to be manufactured for said compensation using said particular
9 technology; and
10 receiving, by said facilitator from said set of one or more parties, compensation for
11 said subsidies based on one or more factors including a factor that reflects
12 market success of said products.

1 54. The method of Claim 53 wherein, for a particular party in said set of one or more
2 parties,
3 the facilitator agrees to provide subsidies for production of products for a defined
4 population of designs; and
5 the particular party agrees to compensate the facilitator for the subsidies based on a
6 factor that reflects market success of each and every article of manufacture
7 produced by or for said particular party based on any design in said defined
8 population of designs.

1 55. The method of Claim 53 wherein:
2 the products include a product for a particular design;
3 manufacture of a product for said particular design using an alternative technology
4 would cost X;
5 manufacture of the product for the particular design using said particular technology
6 costs Y, where Y is greater than X; and
7 the step of providing subsidies includes providing a subsidy that is substantially equal
8 to Y-X for manufacture of said product for said particular design using said
9 particular technology.

- 1 56. The method of Claim 53 wherein the step of compensating the facilitator includes a
2 party from said set of one or more parties paying the facilitator based on number of
3 articles of manufacture manufactured using a product that was subsidized by the
4 facilitator.
- 1 57. The method of Claim 53 wherein the step of compensating the facilitator includes a
2 party from said set of one or more parties paying the facilitator for rental of a product
3 that was subsidized by the facilitator.
- 1 58. The method of Claim 53 wherein the step of compensating the facilitator includes a
2 party from said set of one or more parties paying the facilitator based on revenues
3 derived from articles of manufacture manufactured using a product that was
4 subsidized by the facilitator.
- 1 59. The method of Claim 58 wherein the party pays the facilitator a per-unit amount that
2 decreases with increased volume of sales of articles of manufacture manufactured
3 using said product.
- 1 60. The method of Claim 53 wherein the set of one or more parties includes a plurality of
2 parties.
- 1 61. The method of Claim 53 wherein the set of one or more product makers includes a
2 plurality of product makers.
- 1 62. The method of Claim 60 wherein the set of one or more product makers includes a
2 plurality of product makers.
- 1 63. The method of Claim 53 further comprising the step of the facilitator certifying
2 product makers that satisfy certain quality criteria.
- 1 64. The method of Claim 53 further comprising the step of the facilitator selecting the
2 one or more product makers to manufacture said products.

- 1 65. The method of Claim 53 further comprising the step of the facilitator gathering
2 information about jobs performed by product makers, wherein said one or more
3 product makers are selected to manufacture said products based on said information.
- 1 66. The method of Claim 65 further comprising the step of the facilitator determining
2 which product makers to certify based on said information.
- 1 67. The method of Claim 53 further comprising the step of the facilitator performing one
2 or more quality assurance tests on said products.
- 1 68. The method of Claim 67 wherein the step of performing one or more quality
2 assurance tests is performed for a given product prior to the facilitator releasing said
3 given product to said one or more parties.
- 1 69. The method of Claim 53 further comprising the step of the facilitator obtaining a
2 volume discount from a product manufacturer based on a contract in which the
3 facilitator agrees to use the product manufacturer to produce products for a plurality
4 of said one or more parties.
- 1 70. The method of Claim 53 further comprising the step of the facilitator purchasing an
2 option from a product maker that commits the product maker to perform a certain
3 volume of future work for the facilitator; and
4 wherein the step of causing a set of one or more product makers to manufacture said
5 products includes said facilitator exercising said option.
- 1 71. The method of Claim 53 further comprising the step of facilitator causing designs of
2 at least some of the articles of manufacture produced using said products to be
3 watermarked.